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..... to obtain a honeycomb formed material having a partition wall (partition wall 2 in Fig. 2) thickness of 310 μm , a cell density of 46.5 cells / cm^2 (300 cells/in.², a square section of 35 mm x 35 mm and a length of 152 mm. The
5 formed material was subjected to debinding at 400°C in the atmosphere and then fired at about 1,450°C in an Ar inert atmosphere to obtain a porous honeycomb structure (honeycomb segment) made of SiC bonded with Si.

[0059]

10 The honeycomb segment was measured for average pore diameter by mercury porosity, as well as for porosity by the Archimedes method. As a result, the honeycomb segment was a carrier having a porosity of 52% and an average pore diameter of 20 μm . This honeycomb segment is termed "base material A".

15 [0060]

A SiC powder having an average particle diameter of 12 μm as a ceramic raw material, iron oxide and yttrium oxide each as a sintering aid, methyl cellulose as an organic binder, starch as a pore former, a surfactant and water were
20 kneaded by a vacuum pug mill to produce a plastic puddle.

[0061]

The puddle was subjected to extrusion to obtain a honeycomb structure. The honeycomb structure was dried using a microwave and hot air to obtain a honeycomb formed material
25 having a partition wall thickness of 310 μm , a cell density of 46.5 cells / cm^2 (300 cells/in.²), a square section of 35 mm x 35 mm and a length of 152 mm. The formed material was subjected to debinding at 550°C in the atmosphere and then fired at 2,300°C in an Ar inert atmosphere to obtain a porous
30 honeycomb structure (honeycomb segment) made of

recrystallized SiC.

[0062]

The honeycomb segment was measured for average pore diameter by mercury porosity, as well as for porosity by the
5 Archimedes method. As a result, the honeycomb segment was a carrier having a porosity of 42% and an average pore diameter of 10 μm . This honeycomb segment is termed "base material B".

[0063]

Next, the base materials A and B produced above were
10 subjected to a heat treatment by a method shown in Table 1, to form a film (an oxide film) on the surface.

[0064]

In Examples 1 to 6, 13, 14, 18 and 19, the heat treatment was conducted, as shown in the following (1) and
15 (2), by either of a method of conducting a heat treatment after firing (expressed as "After firing" in the column of "Heat treatment step" of Table 1) and a method of conducting a heat treatment after debinding but before firing (expressed as "After debinding" in the column of "Heat treatment step"
20 of Table 1).

[0065]

(1) A method of conducting a heat treatment after firing:

A method in which, after debinding, firing is conducted in an Ar atmosphere and then a heat treatment is conducted
25 (Examples 1 to 6, 18 and 19).

[0066]

(2) A method of conducting a heat treatment after debinding but before firing:

A method in which, after debinding, a heat treatment is
30 conducted, and then firing is conducted in an Ar atmosphere

(Examples 13 and 14).

[0067]

In Example 15, the heat treatment was conducted by
subjecting air to bubbling using a wetter and sending an air
5 containing water vapor (steam) into a furnace for heat
treatment [expressed as "Steam blowing" in the column of
"Heat treatment conditions (temp. and time)" of Table 1].
The heater temperature of the wetter was 40°C.

[0068]

10 In Examples 16 and 17, the heat treatment was conducted
by burner combustion and heating using LNG (liquefied natural
gas) as a fuel (expressed as "Burner combustion" in the
column of "Heat treatment conditions (temp. and time)" of
Table 1]. The air and fuel ratio was about 1.2 in the
15 highest temperature range.

[0069]

In Examples 7 to 9, the heat treatment was conducted
after pre-coating of sol (expressed as "ZrO₂" or "Al₂O₃" in
the column of "Pre-coating" of Table 1). That is, in
20 Examples 7 to 8, the base material A was dipped in an alumina
sol (nitric acid solution) or a zirconia sol (nitric acid
solution) (as necessary, further in a silica sol) for wash
coating. The amount of coating was 30 g/liter. Then, baking
was conducted at a temperature shown in Table 1. After this
25 baking, a heat treatment was conducted at a temperature shown
in Table 1. After the firing, the crystalline phase formed
was identified by X-ray diffraction, which confirmed
formation of zircon in Examples 7 and 8 and formation of
mullite in Example 9. That is, in Examples 7 to 9, the
30 treatment was conducted according to the following procedure.

Debinding was conducted; then, firing was conducted in an Ar atmosphere; thereafter, a sol was pre-coated; and a heat treatment was conducted.

[0070]

5 In Examples 10 to 12, a precursor was added to the raw materials and the heat treatment was conducted (expressed as "ZrO₂" or "Al₂O₃" in the column of "Addition to raw material(s)" of Table 1). That is, in the step of production of base material A, zirconia or alumina was added to raw
10 materials in an amount of 5% by mass; firing was conducted; then, a heat treatment was conducted at a temperature shown in Table 1. After the firing, the crystalline phase formed was identified by X-ray diffraction, which confirmed formation of zircon in Examples 10 and 11 and formation of
15 mullite in Example 12.

[0071]

 In Comparative Example 1, only firing was conducted to the base material A and no heat treatment was conducted. In Comparative Examples 2 to 4, the heat treatment was conducted
20 at a temperature shown in Table 1, according to the method of conducting a heat treatment after firing (Comparative Examples 2 and 3) or the method of conducting a heat treatment after debinding but before firing (Comparative Example 4). In Comparative Example 5, only firing was
25 conducted to the base material B and no heat treatment

Claims

[1] A silicon carbide-based catalyst body comprising:

a porous honeycomb structure wherein silicon carbide particles as the aggregate thereof are bonded to one another
5 with pores held among them, and

a catalyst loaded on the surface of the porous honeycomb structure, containing alumina and ceria as main components,

characterized in that the catalyst is loaded on the surface
10 of the porous honeycomb structure via a film comprising a silicon-containing oxide and that the film contains oxygen in an amount of 2 to 10% by mass of the total elements constituting the porous honeycomb structure.

[2] A silicon carbide-based catalyst body according to
15 Claim 1, wherein the film contains alumina and/or zirconia as the element (elements) thereof.

[3] A silicon carbide-based catalyst body according to Claim 1 or 2, characterized in that the film contains, as the crystalline phase thereof, at least one member selected from
20 the group consisting of cristobalite, zircon and mullite.

[4] A silicon carbide-based catalyst body according to any of Claims 1 to 3, characterized in that the silicon carbide particles are bonded by metallic silicon as the binder thereof.

25 [5] A method for preparing a silicon carbide-based catalyst body, characterized by extruding a raw material containing silicon carbide particles to obtain a honeycomb structure, firing the honeycomb structure, then subjecting the fired honeycomb structure to a heat treatment in an oxygen-
30 containing atmosphere to obtain a porous honeycomb structure,

and loading, on the surface of the porous honeycomb structure,
a catalyst containing alumina and ceria as main components.

[6] A method for preparing a silicon carbide-based catalyst
body according to Claim 5, wherein the heat treatment is
5 conducted in an atmosphere containing oxygen and steam.

[7] (After amendment) A method for preparing a silicon
carbide-based catalyst body according to Claim 5 or 6,
wherein the heat treatment is conducted by heating a target
substance directly with a heat generated by burner combustion
10 using natural gas as a fuel.

[8] A method for preparing a silicon carbide-based catalyst
body according to any of Claims 5 to 7, wherein the heat
treatment is conducted at a temperature of 800 to 1,400°C.

[9] A method for preparing a silicon carbide-based catalyst
15 body, characterized by extruding a raw material containing
silicon carbide particles to obtain a honeycomb structure,
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